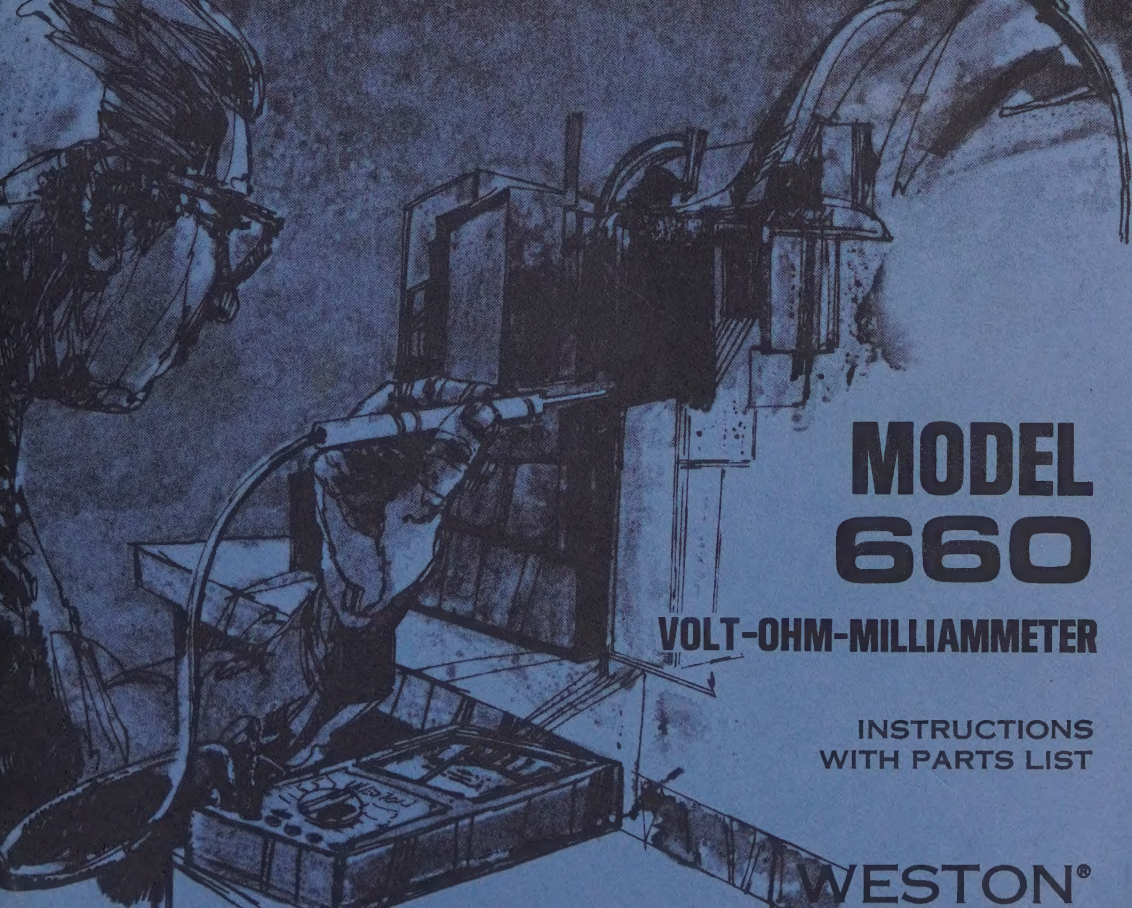




MODEL 660

VOLT-OHM-MILLIAMMETER

INSTRUCTIONS
WITH PARTS LIST

WESTON®

SAFETY NOTICE

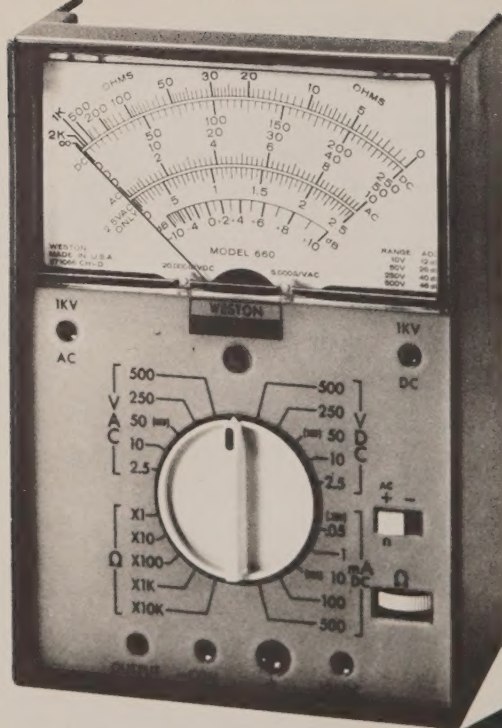
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AVOID CONTACT WITH ANY EXPOSED ENERGIZED ELECTRICAL CIRCUITS.

UNDER CERTAIN CONDITIONS, DANGEROUS POTENTIALS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITIONS DUE TO CHARGES RETAINED BY CAPACITORS. TO AVOID HAZARDS, ALWAYS REMOVE POWER AND DISCHARGE AND GROUND CIRCUITS BY USE OF A GROUNDING STICK PRIOR TO TOUCHING THEM.

WHEN MAKING HIGH VOLTAGE MEASUREMENTS, DO NOT TOUCH THE TEST LEADS OR THE INSTRUMENT. BEFORE MAKING CONNECTIONS TO OR CHANGING THE POLARITY OF HIGH VOLTAGE CIRCUITS, ALWAYS FIRST DE-ENERGIZE THE CIRCUIT.

DANGEROUS ARCS OF EXPLOSIVE NATURE CAN OCCUR IF THE CIRCUIT IS SHORTED IN HIGH POWER CIRCUIT AREAS SUCH AS DISTRIBUTION TRANSFORMERS. ALWAYS SET THE RANGE SWITCH OF THE INSTRUMENT TO THE CORRECT POSITION BEFORE TAKING MEASUREMENTS. WHEN TAKING VOLTAGE MEASUREMENTS, NEVER SET RANGE SWITCH TO THE CURRENT OR LOW RESISTANCE POSITION.



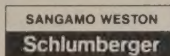
**INSTRUCTIONS
FOR
WESTON
MODEL 660
VOLT-OHM-MILLIAMMETER**

(PATENTS PENDING)

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614 FRELINGHUYSEN AVENUE, NEWARK, N.J. 07114



F-3695 R8

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Printed in U.S.A.

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GENERAL DESCRIPTION

GENERAL: The Model 660 is a portable self-contained analog multimeter for bench, laboratory and field use. (See Figure 1) It is housed in a shock resistant polycarbonate thermoplastic case, and is designed for the greatest convenience, utility and ruggedness. The unit will withstand extremely rough handling with minimum degradation of accuracy and little damage. (See Warranty) Precision metal film, wire wound and carbon film resistors of $\pm 1\%$ tolerance are used to extend the range of a ruggedized taut band suspension, self-shielded core magnet microammeter. All components are mounted on two parallel circuit boards that plug together to form an assembly with no soldering required. Ranges have been chosen to give the best coverage for measurements in the electric and electronic fields. A large 4" scale is provided for easy readability. Separate scales are provided for the 2.5 V AC range, the balance of the AC ranges, the DC ranges, DECIBELS, and OHMS. The ohms scale, with a 20 ohms center value, is figured from 0 to 2000 and is calibrated to provide accurate readings with good resolution.

A single knob and two banana jacks labeled + and - COM handle the majority of ranges. The 10 amp DC, Output and kilovolt ranges are on separate jacks. A 2 amp fuse that can be changed from the front without taking the instrument apart is provided in the + jack.

ACCESSORIES:

Standard:

1. Test leads (spare set) Weston Part/Drawing No. 270066. The leads are provided with

test prods and an insulated screw on alligator clip.

Optional at Extra Cost:

1. Protective Leather Carrying Case — Weston Part/Drawing No. 9970-271958
2. High Voltage Probe and Cable Assembly — Weston Part/Drawing No. 9970-271962 (less multiplier resistor)
50 KV DC multiplier resistor extends 500 VDC range X 100 - Weston Part/Drawing No. 272890
25 KV DC multiplier resistor extends 250 V DC range X 100 — Weston Part/Drawing No. 271960

SPECIFICATIONS

TEMPERATURE INFLUENCE: The metering circuit, (0.25 V DC range) is temperature compensated for the copper of the moving element with a thermistor-shunt combination resulting in a temperature coefficient for that range within 0.1% per $^{\circ}\text{C}$ over a $\pm 10^{\circ}\text{C}$ change from 25°C ambient. Low temperature error is maintained for other ranges by the use of multipliers and shunts constructed from 150 PPM per $^{\circ}\text{C}$ metal film, and 90 PPM and 50 PPM wire wound resistors. High voltage multipliers are constructed from 500 PPM per $^{\circ}\text{C}$ carbon film resistors. This results in a temperature coefficient for all DC ranges of 1% and for all AC ranges of 1.5% or better for a $\pm 10^{\circ}\text{C}$ change from room temperature.

ACCURACY: The following accuracies are based on meter in horizontal position:

DC Volts: 0.25 – 1000 $\pm 2\%$

AC Volts: 2.5 – 1000 $\pm 3\%$

(60Hz Sine wave)

DC Current: 0.05ma $\pm 1.5\%$

1 – 500ma $\pm 2\%$

10 amps $\pm 2\%$

Ohms: $\pm 2^\circ$ of scale angle, approx.

$\pm 2\%$ of scale length or

± 1 division as read on the DC scale.

FREQUENCY INFLUENCE: The error due to the influence of frequency on the AC ranges is given in Table 1 based on using the + and –COM input jacks

TABLE 1. FREQUENCY RESPONSE

<i>A.C. VOLT Ranges</i>	<i>Frequency Response</i>
2.5	3% from 25Hz to 100KHz
10	3% from 25Hz to 100KHz
50	5% from 25Hz to 100KHz
	3% from 25Hz to 50KHz
250	5% from 25Hz to 10KHz
	3% from 25Hz to 5KHz

Ranges:

DC VOLTS	AC VOLTS	OUTPUT dB	DC CURRENT	OHMS	
				FULL SCALE	CENTER SCALE
0.25	2.5	-10 to +10	0.05ma	2,000	20
2.5	10	+2 to +22	1ma	20,000	200
10	50	+16 to +36	10ma	200,000	2,000
50	250	+30 to +50	100ma	2 Meg	20,000
250	500	+36 to +56	500ma	20 Meg	200,000
500	1000		10 amps		
1000					

OPERATING INSTRUCTIONS

REVERSING SWITCH: A polarity reversing mode switch is located on the right of the front panel above the ohms adjust wheel. Two positions are provided labeled AC + Ω for normal operation and - for reverse DC operation. The AC + Ω position is used when measuring AC voltage, OHMS or DC with -COM input jack negative. The - position is used when the polarity of applied DC is reversed or when it is more convenient to reverse the meter polarity than the test leads.

HIGH VOLTAGE PRECAUTIONS: When making high voltage measurements, do not touch the leads or the Model 660. Before making connections to or changing the polarity of high voltage circuits, always first de-energize the circuit. To minimize the hazard of high voltage, it is good practice to be certain to insert the banana plug fully into the jack so that no bare metal is exposed.

DC VOLTAGE MEASUREMENTS TO 500 V:

1. Set MODE switch to AC + Ω .
2. Rotate RANGE switch to desired DC VOLTAGE range.
3. Plug BLACK test lead into -COM jack and connect to LOW POTENTIAL circuit point.
4. Plug RED test lead into + jack and with circuit to be tested de-energized and connect to HIGH POTENTIAL circuit point.

CAUTION:

If voltage to be measured is unknown, start at the 500 V RANGE and work DOWN.

5. Energize circuit.

6. Without touching meter or leads, read DC VOLTAGE on DC arc.

Range Switch Setting

(0.25 V) *

2.5 V

10 V

50 V

250 V

500 V

Figures Used

0 to 250 $\div$ 1000

0 to 250 $\div$ 1000

0 to 10

0 to 50

0 to 250

0 to 50 x 10

*The 0.25 V DC range and the 0.05 ma DC range use the same switch position.

DC VOLTAGE ABOVE 500 V:

1. Rotate RANGE switch to (1KV)50 OR 500 DC position.
2. Plug BLACK test lead into -COM jack and connect to GROUND or LOW POTENTIAL circuit point.
3. Plug RED test lead into the 1KVDC jack corresponding to RANGE selected in step 1.
4. With circuit to be tested de-energized, connect RED lead to TEST POINT.
5. Energize circuit.
6. Without touching meter or leads, read DC VOLTAGE on DC arc.

Range

1000 V DC

Switch Setting

(1KV) 50 V DC

Figures Used

0 to 10 x 100

AC VOLTAGE MEASUREMENTS TO 500 V:

1. Set MODE switch to AC + Ω .
2. Rotate RANGE switch to desired AC VOLTAGE range.
3. With circuit to be tested de-energized, plug BLACK test lead in -COM jack and connect to LOW POTENTIAL circuit point.
4. Plug RED test lead into + jack.

CAUTION:

If voltage to be measured is unknown, start at 500 V RANGE and work DOWN.

5. Energize circuit.
6. Without touching meter or leads; read AC VOLTAGE less than 2.5V AC directly on LOWER AC arc and read AC VOLTAGE above 2.5V AC on UPPER AC arc.

Range

Switch Setting	Figures Used	Scale Arc Used
2.5 V	0 - 2.5	Lower AC
10 V	0 - 10	Upper AC
50 V	0 - 50	Upper AC
250 V	0 - 250	Upper AC
500 V	0 - 50 X 10	Upper AC

AC VOLTAGE MEASUREMENTS ABOVE 500V:

1. Set MODE switch to AC + Ω .
2. Rotate RANGE switch to 50 (1KV) or 500 AC position.
3. Plug BLACK test lead into the -COM jack and connect to GROUND or LOW POTENTIAL circuit point.
4. Plug RED test lead into the 1KVAC jack corresponding to RANGE selected in step 2.
5. With circuit to be tested de-energized, connect RED lead to TEST POINT.

6. Energize circuit.

7. Without touching meter, read HIGH VOLTAGE AC on the UPPER AC arc.

Range	Switch Setting	Figures Used
1000 V AC	50 (1KV) AC	0 to 10 X 100

DC CURRENT MEASUREMENTS TO 500 ma

1. Rotate RANGE switch to desired CURRENT range. If range is unknown start with 500 MA and work DOWN.
2. Plug BLACK test lead into -COM jack.
3. Plug RED test lead into + jack.
4. Connect LEADS in series with LOAD.
5. With the MODE switch set to AC + Ω , current *into* RED lead and *out* of BLACK lead will produce an up scale reading when circuit is energized.
6. Read DC CURRENT on DC arc.

Range	Figures Used
Switch Setting	
0.05 ma*	0 - 50 $\div$ 1000*
1 ma	0 - 10 $\div$ 10
10 ma	0 - 10
100 ma	0 - 10 X 10
500 ma	0 - 50 X 10

*The 0.05 ma range may be read as 50 μ a using the figures 0 - 50 without the conversion factor of 1000.

DC CURRENT ABOVE 500 ma:

1. Rotate RANGE switch to (10A) 10 position.
2. Plug BLACK test lead into the -COM jack.
3. Plug RED test lead into the 10 A DC jack.
4. Connect LEADS in series with LOAD.
5. With the MODE switch set to AC + Ω , current *into* RED lead and *out* of BLACK lead will produce an up scale reading when circuit is energized.
6. Read DC CURRENT on DC arc.

<i>Range Switch Setting</i>	<i>Figures Used</i>
(10A) 10 ma DC	0 – 10

RESISTANCE MEASUREMENTS:

CAUTION:

Make sure all power is off before connecting the Model 660 to the test circuit.

1. Set MODE switch to AC + Ω position.
2. Plug BLACK test lead into -COM jack.
3. Plug RED test lead into + jack.
4. Rotate RANGE switch to desired ohmmeter range.
5. Short TEST LEADS together and set POINTER to FULL SCALE position (0 ohms) by adjusting the Ω thumbwheel.
6. Read RESISTANCE on the OHMS arc.

<i>Range Switch Setting</i>	<i>Multiply Scale Readings By</i>
$\Omega \times 1$	1
$\Omega \times 10$	10
$\Omega \times 100$	100
$\Omega \times 1K$	1000
$\Omega \times 10K$	10,000

NOTE:

1. Polarity of internal battery voltage is POSITIVE on + jack and NEGATIVE on -COM jack.
2. If the ohmmeter can not be adjusted to the 0 ohms scale position on the ($\Omega \times 1$) range, then replace the 1.5 V "D" Cell; on the ($\Omega \times 10K$) range, replace the 15 V battery.

OUTPUT METER MEASUREMENTS:

The output meter is used for making AC voltage measurements when DC voltage is present. When using the OUTPUT jack of the Model 660, the DC component is blocked by a 0.22 μ fd 400 volt capacitor. The cutoff frequency of the output meter is altered from the data given in Table 1 as follows:

<i>Range</i>	<i>Low Frequency Cutoff</i>
2.5 V AC	1K Hz
10 V AC	300 Hz
50 V AC	50 Hz

To use the output meter of the Model 660, follow the instructions given under "AC Voltage Measurements to 500 VAC" except plug the RED lead into the OUTPUT jack.

DECIBEL MEASUREMENTS:

To measure decibels, follow the procedure under "AC Voltage Measurements to 500 V AC". If DC blocking is desired, follow the procedure under Output Meter Measurements above. Read

decibels on the arc marked -10 to +10 dB. Zero power level is based on 1 milliwatt in a 600 ohm line. This condition must be met for making absolute dB measurements.

	<i>dB Range</i>	<i>Add to Reading on -10 to +10 dB arc</i>
2.5 V AC	-10 to +10	0
10 V AC	+ 2 to +22	+12
50 V AC	+16 to +36	+26
250 V AC	+30 to +50	+40
500 V AC	+36 to +56	+46

NOTE: When reading -10 to +10 dB on the 2.5 volt A range, the (0 dB) mark is high by approximately 1 dB due to the rectifier characteristic of that range. Use DATA on dB LEVELS, Table 2, to determine dB level corresponding to the voltage indicated if a more accurate reading is desired.

TABLE 2. DATA ON dB LEVELS

<i>Power Level dB</i>	<i>Volts, based on 0 dB of</i>		
	<i>6MW in 500 Ohms</i>	<i>6 MW in 600 Ohms</i>	<i>1 MW in 600 Ohms</i>
-10	0.548	0.600	0.245
- 9	0.614	0.673	0.275
- 8	0.689	0.755	0.308
- 7	0.774	0.847	0.346
- 6	0.868	0.951	0.388
- 5	0.974	1.067	0.436
- 4	1.093	1.197	0.489
- 3	1.226	1.343	0.548
- 2	1.376	1.507	0.615
- 1	1.544	1.691	0.690
0	1.732	1.897	0.775

Table 2 continued)

Power Level dB	Volts, based on 0 dB of		
	6MW in 500 Ohms	6 MW in 600 Ohms	1 MW in 600 Ohms
+ 1	1.943	2.129	0.869
+ 2	2.180	2.389	0.975
+ 3	2.447	2.680	1.094
+ 4	2.745	3.007	1.228
+ 5	3.080	3.374	1.377
+ 6	3.456	3.787	1.545
+ 7	3.878	4.248	1.734
+ 8	4.351	4.766	1.946
+ 9	4.882	5.347	2.183
+10	5.477	6.000	2.449
+11	6.145	6.732	2.748
+12	6.895	7.554	3.084
+13	7.737	8.475	3.460
+14	8.681	9.509	3.882
+15	9.740	10.67	4.356
+16	10.93	11.97	4.887
+17	12.26	13.43	5.484
+18	13.76	15.07	6.153
+19	15.44	16.91	6.904
+20	17.32	18.97	7.746
+21	19.43	21.29	8.691
+22	21.80	23.89	9.752
+23	24.47	26.80	10.94
+24	27.45	30.07	12.28
+25	30.80	33.74	13.77
+26	34.56	37.87	15.45
+27	38.78	42.48	17.34

(Table 2 continued)

Power Level dB	Volts, based on 0 dB of		
	6MW in 500 Ohms	6 MW in 600 Ohms	1 MW in 600 Ohms
+28	43.51	47.66	19.46
+29	48.82	53.48	21.83
+30	54.77	60.00	24.49
+31	61.45	67.32	27.48
+32	68.95	75.54	30.84
+33	77.37	84.75	34.60
+34	86.81	95.09	38.82
+35	97.40	106.70	43.56
+36	109.3	119.7	48.87
+37	122.6	134.3	54.84
+38	137.6	150.7	61.53
+39	154.4	169.1	69.04
+40	173.2	189.7	77.46
+41	194.3	212.9	86.91
+42	218.0	238.9	97.51
+43	244.7	268.0	109.4
+44	274.5	300.7	122.8
+45	308.0	337.4	137.7
+46	345.6	378.7	154.6
+47	387.8	424.8	173.4
+48	435.1	476.6	194.6
+49	488.2	534.7	218.3
+50	547.7	600.0	244.9

THEORY OF OPERATION

DC VOLTMETER: The basic circuit is constructed to be a 250 millivolt meter using a 50 microamp indicator resulting in a sensitivity of 20,000 ohms per volt and a resistance of 5000 ohms. The 250 millivolt circuit is temperature compensated for the copper resistance of the microammeter by the

use of a thermistor RT1 and shunt R41 combination. As the range is changed, additional resistance is added in series with the 250 millivolt circuit to maintain 20,000 ohms per volt at the selected voltage steps. The simplified circuit is shown in fig. 2.

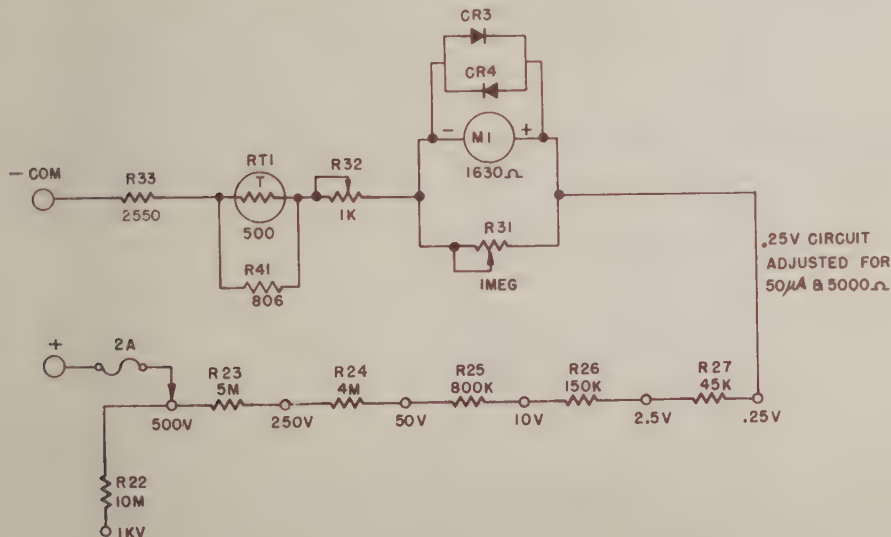


FIGURE 2. DC VOLTS CIRCUIT

AC VOLTMETER: AC voltage is converted to DC by a full wave half bridge germanium rectifier circuit and averaged by the microammeter. Scale calibration is RMS of a sine wave. The germanium rectifier used is selected for low reverse current and low forward resistance allowing the 2.5 VAC range to be more linear in its characteristic than if

silicon rectifiers were used. The bridge circuit is adjusted for a sensitivity of 200 microamperes AC. As the range is changed, additional resistance is added in series with the AC input to the bridge rectifier circuit at a value corresponding to 5000 ohms per volt. The simplified circuit is shown in figure 3.

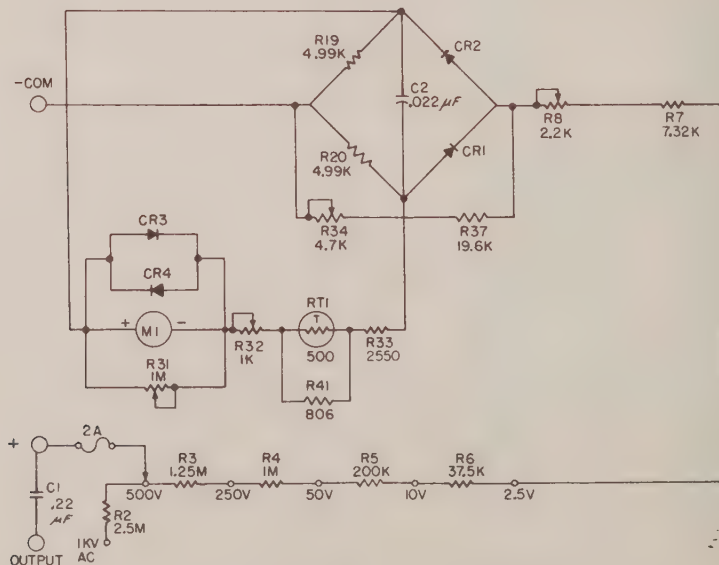


FIGURE 3. AC VOLTS CIRCUIT

DECIBEL METER: The dB meter uses the circuitry of the AC Voltmeter for its operation. Decibels are read on the dB scale which is based on a (0 dB) power level of 0.001 watts in 600 ohms. *Absolute* readings on the dB scale are correct when the (0 dB) power level is set to 0.001 watts and the dB measurement is made across 600 ohms. (.775 AC volts into 600 ohms)

OHMMETER: A conventional series ohmmeter circuit is used as illustrated in Figure 4. The circuit is designed for a center scale value of 20 ohms on the (x 1) range. Ranges are changed by altering the internal resistance and sensitivity for the (x 1) through (x 1000) ranges. On the (x 10,000) ranges, the internal resistance and supply voltage are changed maintaining the sensitivity of the (x

1000) range. The internal resistance for any range is equal to the center scale resistance value of that range; either 20, 200, 2000, 20,000 or 200,000 ohms. The internal power supplied to the (x 1) through (x 1000) ranges is 1.5 volts DC nominal and for the (x 10,000) range is 15 volts DC nominal. The maximum short circuit current will occur on the (x 1) range and will have a value of approximately 80 milliamperes with a new battery. The maximum open circuit voltage will occur on the (x 10,000) range and will have a value of approximately 16.5 volts with a new battery.

The sensitivity of the microammeter is adjusted for variations in battery voltage by the thumb-wheel adjusting pot, R36.

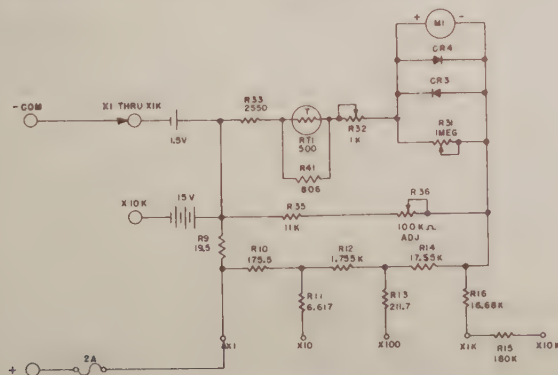


FIGURE 4. OHMMETER CIRCUIT

DC CURRENT METER: An Ayrton type shunt network is used in the DC current meter as illustrated in Figure 5. This type of shunt allows current to be reduced for measurement while maintaining a constant damping resistance across the microammeter. The metering portion of this circuit is

adjusted to 250 millivolts at 50 microamps and is used for the 0.25 volt DC and 0.050 milliampere range. Current applied to any range will divide inversely proportional to the total resistance in each branch of the parallel circuit.

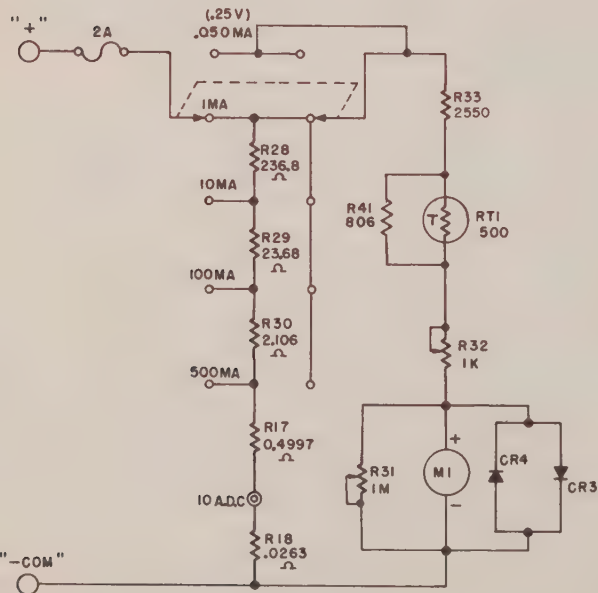


FIGURE 5. DC CURRENT CIRCUIT

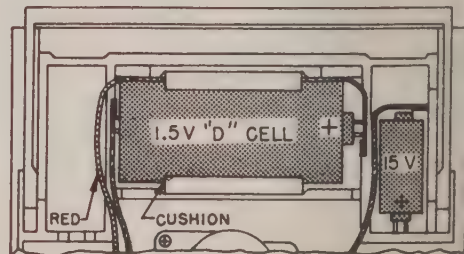


**FIGURE 5A.
BATTERY INSTALLATION DIAGRAM**

MAINTENANCE

INSTALLATION OF BATTERIES:

1. Remove rear cover nut with a coin or thumbnail.
2. Use rear cover nut to pick up bottom of rear cover.
3. Slide rear cover off towards bottom of instrument.
4. Insert 1.5 V "D" cell in space provided with foam cushion. Follow polarity marked on wire.
5. Insert 15 V battery in right compartment. Follow polarity marked on the wire; negative to the top wire clip, positive to the circuit board clip.
6. Be certain batteries are pressed firmly into place.
7. Replace rear cover and rear cover nut.

FUSE REPLACEMENT:

1. Remove rear cover nut. Do not remove rear cover.
2. Insert rear cover nut into + jack.
3. Use rear cover nut as tool to remove + jack fuse holder by turning counterclockwise.
4. Remove fuse from holder with a twist and pull.
5. Replace burned out fuse with a Littlefuse Part No. 361002, 2 amp 8AG instrument fuse or equivalent.
6. Replace fuse holder into + jack and tighten finger tight with rear cover nut tool.
7. Replace rear cover nut.

CALIBRATION: This instrument has been calibrated at the factory. However, if recalibration is required, it can be done without removing the instrument from the case. See Figure 6 for adjustment locations. Minimum calibration equipment required is as follows:

DC Current source capable of 50 microamperes, $\pm 0.5\%$ at 250 millivolts

DC Voltage source capable of 250 millivolts, $\pm 0.5\%$

AC Voltage source capable of 2.5 volts, $\pm 0.75\%$ and 50 volts, $\pm 0.75\%$ at 50 to 100 Hz sine wave output.

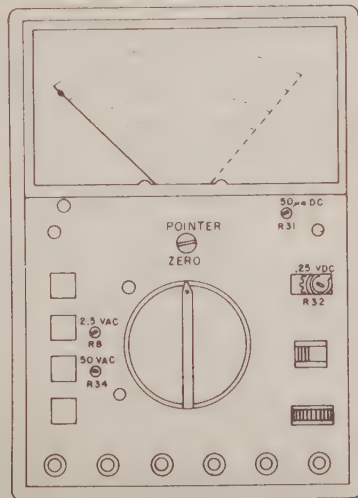


FIGURE 6.

CALIBRATION ADJUSTMENT LOCATIONS 19

Procedure:

1. Remove snap on front plastic range plate by hooking a non-metallic object such as your thumbnail under the plate at the Ω thumbwheel opening and pulling away from the instrument until the front plate snaps off.
2. Place INSTRUMENT in a HORIZONTAL position.
3. Set POINTER on O with screw driver adjustment located about 5/8" below window ledge.
4. Set REVERSING switch to AC + Ω position.
5. Set RANGE switch to 0.05 mA (0.25 V) position. Momentarily drop range plate over switch to be certain switch position is correct.
6. Apply 50 μ A DC to-COM and + jacks.
7. Set POINTER to FULL SCALE deflection by adjusting R31.
8. Apply 250 MV DC to-COM and + jacks.
9. Set POINTER to FULL SCALE deflection by adjusting R32.
10. Set RANGE switch to 50 (1KV) VAC position. Check switch position by overlaying range plate as in step 5.
11. Apply 50 V AC to-COM and + jacks.
12. Set POINTER to FULL SCALE deflection by adjusting R34.
13. Apply 2.5 V AC to-COM and + jacks.
14. Set RANGE switch COUNTERCLOCKWISE to 2.5 VAC position. Again check position with range plate.

15. Set POINTER to FULL SCALE deflection by adjusting R8.
16. Replace front plastic range plate by putting the side closest to the window under the ledge of the window, then press down firmly with both thumbs while encircling the lip around the range switch knob. The plate will snap down under this lip.
17. This completes calibration. All other calibration is fixed by component value and tolerance. If sufficient equipment is available, check full scale value for every other range.

CLEANING PROCEDURE FOR THERMOPLASTIC METER WINDOW:

Clean plastic meter window with absorbent cotton dipped in a solution made by dissolving ½ teaspoon of detergent, such as Vel or Dreft, in one gallon of water. Lightly wipe over window and allow solution to air dry. DO NOT WIPE DRY. DO NOT USE ANY CHEMICAL SOLVENTS TO CLEAN WINDOW OR CASE.

CIRCUIT BOARD REMOVAL:

The circuit boards are removed from the case without unsoldering any wires by the following procedure:

1. Remove rear cover screw and rear cover.
2. Remove batteries and slide battery clips out of the case.
3. Remove two ¼" hex head screws with a ¼" socket type wrench.

4. Remove "snap on" range plate.
5. Remove -COM, + and 10 ADC jacks using the rear cover nut as a tool.
6. Remove circuit board assembly from the case.
7. Carefully unplug the circuit boards from one another.

To reassemble, reverse the above procedure. *Be certain* that the switch rotors and shaft are in alignment before inserting the boards into the case.

COMPONENT REPLACEMENT: Fixed resistors with values up to 1.25 Megohms are either precision metal film or wire wound types. The higher values are carbon film resistors. If for any reason a component on a printed circuit board becomes damaged, it should be removed by cutting the leads close to the body of the component leaving the leads protruding above the board. The replacement component is then soldered directly to these leads, thereby preventing damage to the circuit board rails.

REPLACEMENT PARTS LIST FOR MODEL 660

Circuit Symbol	Description	Weston Part No.
C1	CAPACITOR, METALLIZED POLYESTER FLAT FILM: 0.22 μ f 400 WVDC	272429-001
C2	CAPACITOR, CERAMIC DISC: 0.022 μ f 25 WVDC	272536-001
CR1,CR2	DIODE, GERMANIUM	39705-001
CR3,CR4	DIODE, SILICON	61025-001
E1	WHEEL, THUMB KNOB (ohms adjust)	270781-001
E2	KNOB, SHAFT, range switch	270770-903
E3	DELETED	-

Circuit Symbol	Description	Weston Part No.
E4	ROLLER, DETENT	267334-001
E5	SPRING, DETENT	267333-001
E6	HANDLE	271058-001
E7	DIAL, range plate	270772-910
E8	NUT, THUMB, rear cover	280676-001
F1	FUSE, 2 ampere	60764-001
M1	METER/CASE ASSEMBLY	271693-902
R2	RESISTOR, FIXED, CARBON FILM: 2.5 Megohms, $\pm 1\%$, $\frac{1}{2}$ watt	39679-001
R3	RESISTOR, FIXED, METAL FILM: 1.25 Megohms, $\pm 1\%$, $\frac{1}{2}$ watt	272452-001
R4	RESISTOR, FIXED, METAL FILM: 1.0 Megohm, $\pm 1\%$, $\frac{1}{4}$ watt	272450-001
R5	RESISTOR, FIXED, METAL FILM: 200K ohms, $\pm 1\%$, $\frac{1}{4}$ watt	272448-001
R6	RESISTOR, FIXED, METAL FILM: 37.5K ohms, $\pm 1\%$, $\frac{1}{4}$ watt	272445-001
R7	RESISTOR, FIXED, METAL FILM: 7.32K ohms, $\pm 1\%$, $\frac{1}{4}$ watt	272441-001
R8	RESISTOR, VARIABLE, CARBON COMPOSITION: 2.2K ohms, $\pm 20\%$, 1/10 watt	272354-001
R9	RESISTOR, FIXED, METAL FILM: 19.5 ohms, $\pm 1\%$, 3 watts	276206-001
R10	RESISTOR, FIXED, METAL FILM: 175.5 ohms, $\pm 1\%$, 1/8 watt	272435-001
R11	RESISTOR, FIXED, WIRE WOUND: 6.617 ohms, $\pm 1\%$, 3 watts	272454-001

Circuit Symbol	Description	Weston Part No.
R12	RESISTOR, FIXED, METAL FILM: 1755 ohms, $\pm 1\%$, 1/8 watt	272433-001
R13	RESISTOR, FIXED, METAL FILM: 211.7 ohms, $\pm 1\%$, 1/8 watt	272436-001
R14	RESISTOR, FIXED, METAL FILM: 17.55K ohms, $\pm 1\%$, 1/8 watt	272438-001
R15	RESISTOR, FIXED, METAL FILM: 180K ohms, $\pm 1\%$, 1/8 watt	272439-001
R16	RESISTOR, FIXED, METAL FILM: 16.68K ohms, $\pm 1\%$, 1/8 watt	272437-001
R17	RESISTOR, FIXED, WIRE WOUND: 0.4997 ohms, $\pm 1\%$, 3 watts	272453-001
R18	RESISTOR, FIXED, SHUNT: 0.0263 ohms, $\pm 1\%$, 3 watts	271053-901
R19,R20	RESISTOR, FIXED, METAL FILM: 4.99K ohms, $\pm 1\%$, 1/4 watt	272442-001
R22	RESISTOR, FIXED, CARBON FILM: 10 Megohms, $\pm 1\%$, 1/2 watt	272318-001
R23	RESISTOR, FIXED, CARBON FILM: 5 Megohms, $\pm 1\%$, 1/2 watt	272457-001
R24	RESISTOR, FIXED, CARBON FILM: 4 Megohms, $\pm 1\%$, 1/2 watt	272456-001
R25	RESISTOR, FIXED, METAL FILM: 800K ohms, $\pm 1\%$, 1/4 watt	272449-001
R26	RESISTOR, FIXED, METAL FILM: 150K ohms, $\pm 1\%$, 1/4 watt	272447-001

Circuit Symbol	Description	Weston Part No.
R27	RESISTOR, FIXED, METAL FILM: 45K ohms, $\pm 1\%$, $\frac{1}{4}$ watt	272446-001
R28	RESISTOR, FIXED, METAL FILM: 236.8 ohms, $\pm 1\%$, $\frac{1}{8}$ watt.	272432-001
R29	RESISTOR, FIXED, METAL FILM: 23.68 ohms, $\pm 1\%$, $\frac{1}{8}$ watt	272434-001
R30	RESISTOR, FIXED, WIRE WOUND: 2.106 ohms, $\pm 1\%$, 3 watts	272455-001
R31	RESISTOR, VARIABLE, CARBON COMPOSITION: 1 Megohms, $\pm 20\%$, $\frac{1}{10}$ watt	272381-001
R32	RESISTOR, VARIABLE, CARBON COMPOSITION: 1000 ohms, $\pm 20\%$, $\frac{1}{10}$ watt	272602-001
R33	RESISTOR, FIXED, METAL FILM: 2550 ohms, $\pm 1\%$, $\frac{1}{4}$ watt	278114-001
R34	RESISTOR, VARIABLE, CARBON COMPOSITION: 4.7K ohms, $\pm 20\%$, $\frac{1}{10}$ watt	272431-001
R35	RESISTOR, FIXED, METAL FILM: 11K ohms, $\pm 1\%$, $\frac{1}{4}$ watt	272443-001
R36	RESISTOR, VARIABLE, CARBON COMPOSITION: 100K ohms, $\pm 20\%$, $\frac{1}{2}$ watt	270780-903
R37	RESISTOR, FIXED, METAL FILM: 19.6K ohms, $\pm 1\%$, $\frac{1}{4}$ watt	272444-001
R41	RESISTOR, FIXED, METAL FILM: 806 ohms $\pm 1\%$, $\frac{1}{8}$ watt	278105-001
RT1	THERMISTOR: 500 ohms $\pm 10\%$	278104-001
S1-1	SWITCH: range deck	270779-905
S1-2	SWITCH: function deck	270779-904
S2	SWITCH: reversing	271044-001
W1	LEAD, TEST SET	270066-001
BT1	BATTERY: 1.5 volts; size D	19637-001
BT2	BATTERY: 15 volts; Eveready No. 411	23912-001

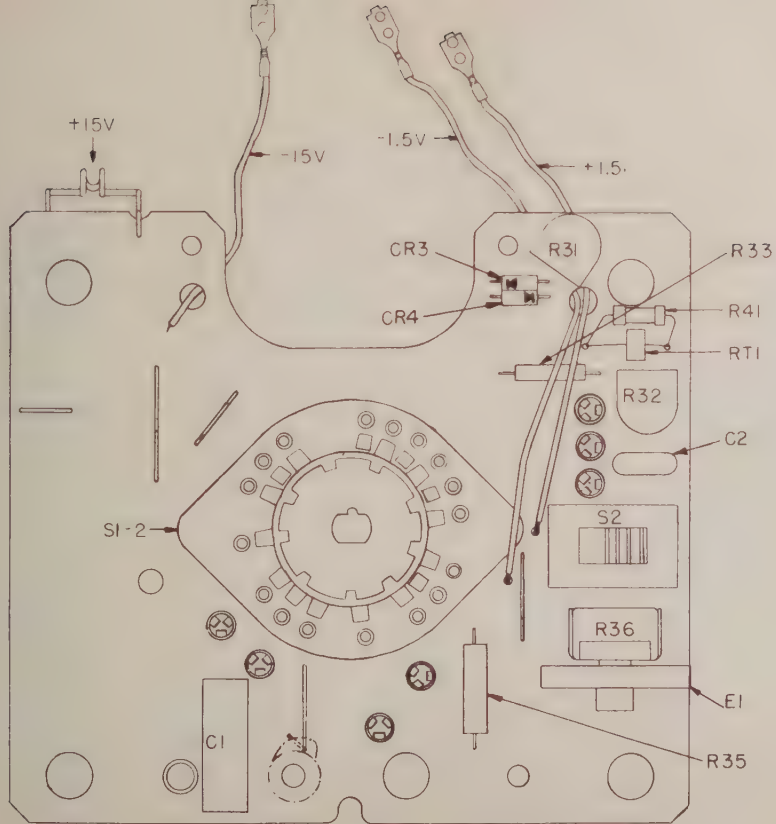
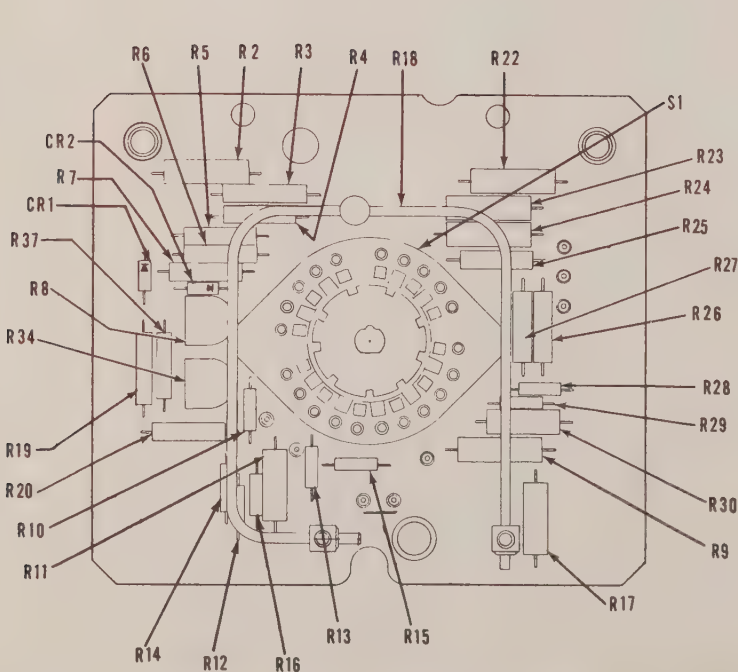


FIGURE 7. INNER BOARD ASSEMBLY



- CR1, CR2-Diode, Germanium
 R2-Resistor, 2.5 Megohms
 R3-Resistor, 1.25 megohms
 R4-Resistor, 1.0 megohm
 R5-Resistor, 200K ohms
 R6-Resistor, 37.5K ohms
 R7-Resistor, 7.32K ohms
 R8-Resistor, 2.2K ohms
 R9-Resistor, 19.5 ohms
 R10-Resistor, 175.5 ohms
 R11-Resistor, 6.617 ohms
 R12-Resistor, 1755 ohms
 R13-Resistor, 211.7 ohms
 R14-Resistor, 17.550 ohms
 R15-Resistor, 180K ohms
 R16-Resistor, 16.68K ohms
 R17-Resistor, 0.4997 ohm
 R18-Resistor, 0.0263 ohm
 R19, R20-Resistor, 4.99K ohms
 R22-Resistor, 10 megohms
 R23-Resistor, 5 megohms
 R24-Resistor, 4 megohms
 R25-Resistor, 800K ohms
 R26-Resistor, 150K ohms
 R27-Resistor, 45K ohms
 R28-Resistor, 236.8 ohms
 R29-Resistor, 23.68 ohms
 R30-Resistor, 2.106 ohms
 R34-Resistor, 4.7K ohms
 R37-Resistor, 19.6K ohms
 S1-1 Switch, Range Deck

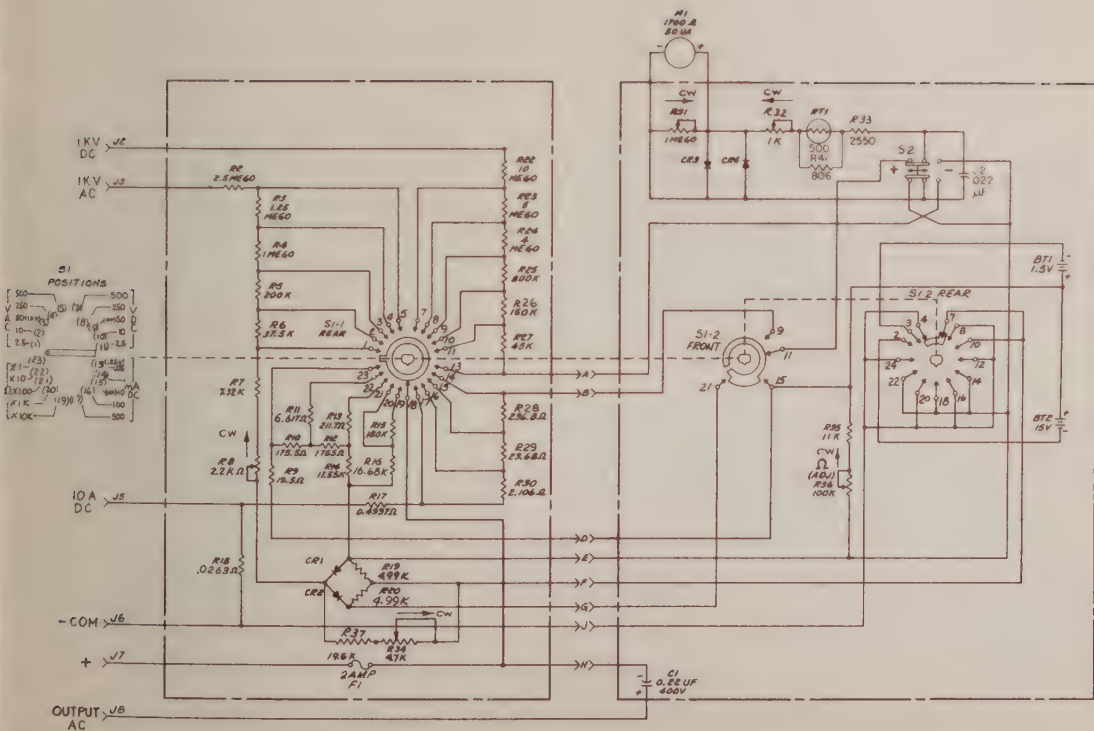


FIGURE 9. SCHEMATIC DIAGRAM

WESTON EQUIPMENT WARRANTY

Weston warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment. The Weston Model 660 series is also warranted to operate with no greater than $\pm 5\%$ degradation in accuracy after a 5 foot drop onto a horizontal floor. This warranty does not include mechanical parts being defaced (scratched, etc.) from a drop or normal usage.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent Weston equipment, at an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller provided that (a) Seller is promptly notified in writing by Buyer upon discovery of defects, (b) Upon receipt of written

authorization from Seller the defective equipment is returned as directed, transportation charges prepaid by Buyer, and, (c) Seller's examination of such equipment discloses to his satisfaction that defects were not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration by the Buyer.

This warranty is in lieu of all other warranties expressed or implied, including the implied warranty of fitness for a particular purpose to the original purchaser or to any other person. Seller shall not be liable for consequential damages of any kind.

The aforementioned provisions do not extend the original warranty period of any article which has been either repaired or replaced by Seller.

NOTES

NOTES

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